

Developing Sediment Cleanup Levels Protective of Human Health for Interim and Final Actions at Superfund Sites

Stephen J. Ells

U.S. EPA

Office Of Superfund Remediation And Technology Innovation
and

Karl E. Gustavson, PhD

USACE

Engineer Research and Development Center

Battelle 6th Conference

New Orleans, Feb. 9, 2011

Purposes of New Directive

- Establish consistent set of objectives and measures to compare alternatives in the FS for COCs like PCBs
- Increase ROD transparency by describing level of risk reduction and timeframe
- Recommend interim remedy if can't reach risk-based cleanup levels or background
- Describe approach and monitoring data needed to develop final ROD

Objectives

- Risk-based protective level
 - Concentration in fish that is protective; e.g., 10^{-4} cancer risk or $HI < 1$
 - Concentration in sediment equivalent to fish conc.
 - Use a food chain model or BSAF
 - Replaces the Remediation Goal from 2005 Sediment Guidance, but not the PRG
- Background level if $>$ risk-based levels

Measures

- Construction complete sediment cleanup level
 - What can be achieved by active remediation at construction completion
 - May be considered a performance standard
 - May be a SWAC
- Construction complete fish tissue concentration
 - Predicted concentration 1 to 2 years after remedy; near equilibrium

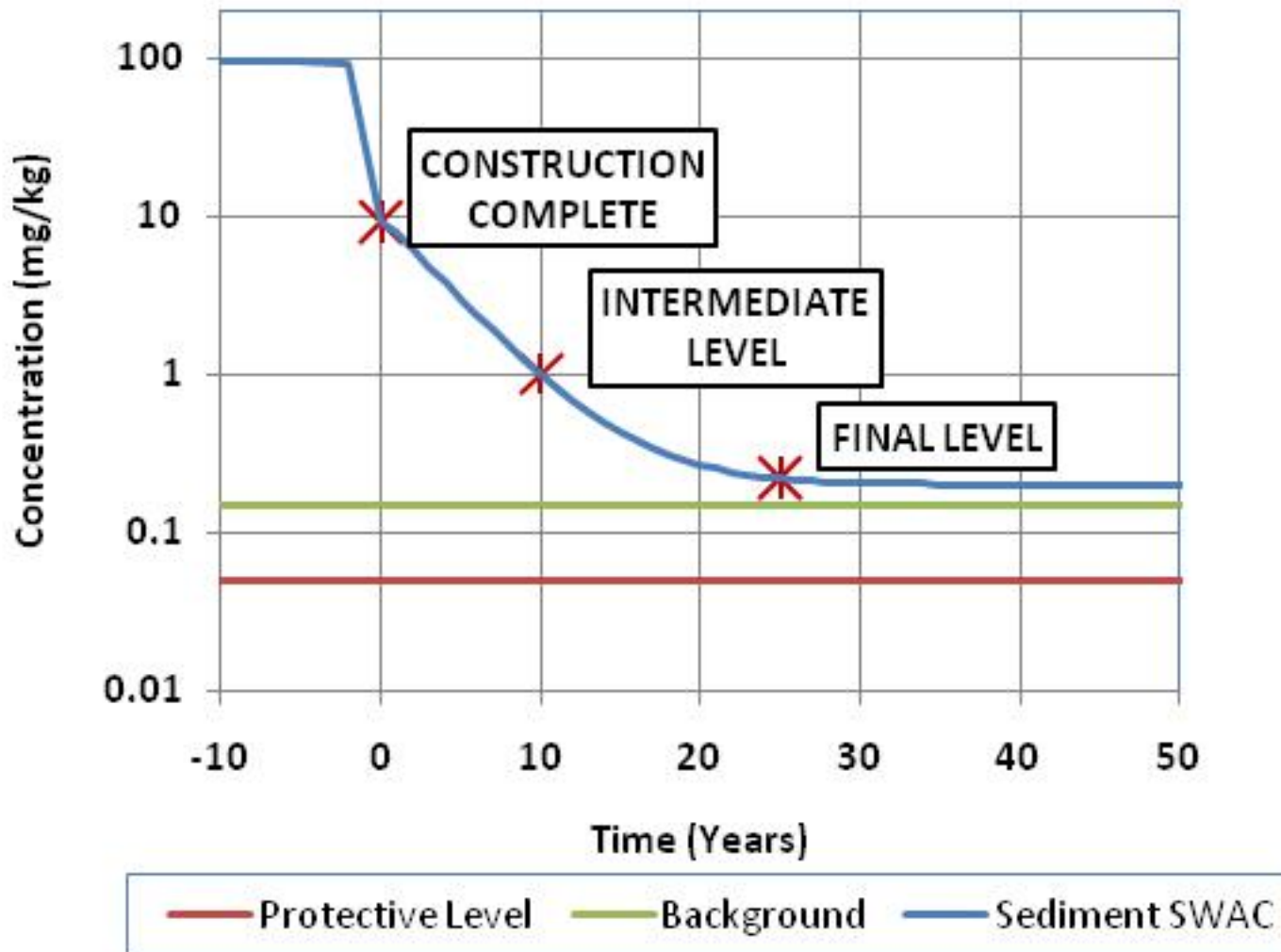
More Measures

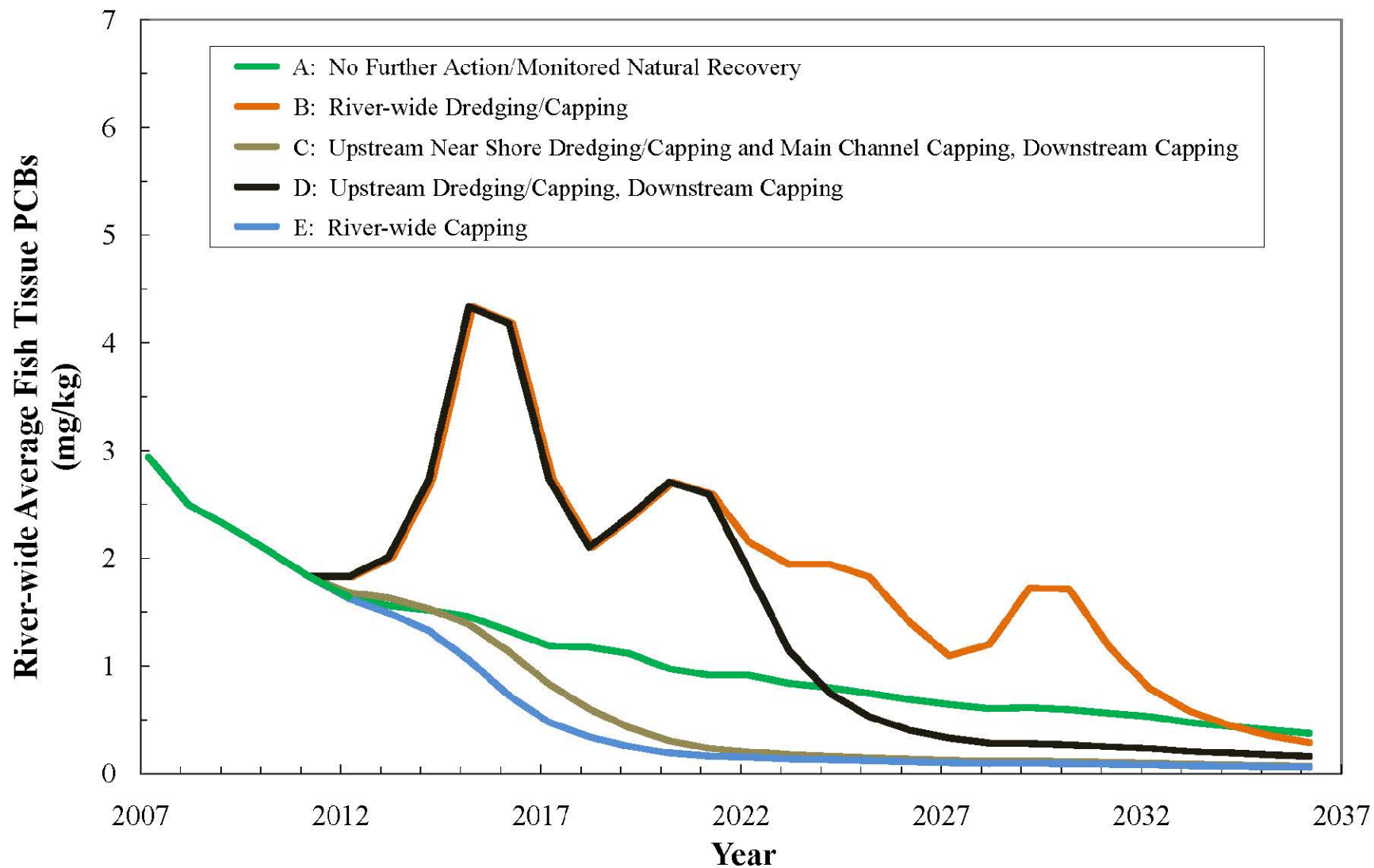
- Final sediment cleanup level
 - Goal is to be the protective concentration
 - May be greater than risk-based conc., or background, *if* not feasible to reach
 - What is predicted to be achieved after years/decades of MNR
- Final fish tissue concentration
 - Concentration equivalent to the final sediment concentration

More Measures

- Intermediate sediment cleanup levels
 - Predicted levels after 5, 10, 20, 30 years
- Intermediate fish tissue concentrations
 - Predicted from sediment concentrations
 - Will lag sediment reductions
- Needed to conduct Five-Year Reviews and evaluate remedial effectiveness

Document Sediment and Corresponding Fish Tissue Levels in ROD





Comparison of Predicted River-wide Average Fish Tissue PCB Levels for Various Alternatives.

Interim RODs and Cleanup Levels

- Achieving protective concentrations or background for PCBs, dioxins/furans, DDTs, MeHg may not be feasible
- Site conditions may not be conducive to dredging, capping, in-situ amendments or MNR
- Not all contamination is typically removed, contained or treated; are unremediated areas
- Can have significant dredge residuals
- Can be ongoing uncontrollable sources

Final vs. Interim Remedies

- If model predicts protective cleanup levels or background won't be reached in reasonable time frame, select interim remedy and ROD
- Protective levels/background, are still selected as cleanup levels, but called interim
- Will need to issue final ROD after monitoring and re-evaluating remedy effectiveness and protectiveness

Monitoring after Interim RODs

- Monitoring remedial effectiveness should always be done, but critical for interim remedies
- Need at least 3 sets of sediment and fish samples over several years
- Use data to recalibrate model and predict new level of risk reduction
- If still won't reach protective levels/background, select final cleanup levels that can be reached
- Recognize that background may decrease
- Existing Five Year Review process used to make decisions

Summary Points

- Use same measures to evaluate remedy effectiveness before and after cleanup
- Strive to reach protective levels at all sediment sites
- Recognize that pre-remedy model predictions have high uncertainty
- Acknowledge cleanup to protective levels or background may not be feasible, but need post-remedy data to confirm this
- May have to rely on fish consumption advisories for remedy to be protective

Principal Uno

Superfund's goal at contaminated sediment sites is to implement cost-effective remedies that will control sources and achieve long-term protection while minimizing short-term impacts.